

Q- An object is placed 58 cm from a concave mirror of radius 33 cm.

(a) Find the location of the image.

(b) What is the magnification of the mirror?

The sign convention is taken as the SI convention in which the distances measured in the direction of incident rays are taken as positive.

(a) The focal length of a curved mirror is one-half of the radius of the curvature and thus

$$f = R/2 = -33/2 = -16.5 \text{ cm}$$

As the center of curvature and the focus point is in front of the mirror the focal length will be negative,

$$u = -58 \text{ cm}$$

The mirror formula is

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

Substituting the values we will get

$$\frac{1}{-16.5} = \frac{1}{-58} + \frac{1}{v}$$

$$\text{Or } \frac{1}{v} = \frac{1}{-16.5} - \frac{1}{-58} = \frac{1}{-16.5} + \frac{1}{58}$$

$$\text{Or } v = \frac{16.5 \times 58}{-58 + 16.5} = -23.06 \text{ cm}$$

Here the negative sign shows that the image is in front of the mirror. As the image distance is more than focal length, the image will be real.

(b) The magnification of the image is given by

$$m = -\frac{v}{u} = -\frac{23.06}{58} = -0.4$$

Hence the magnification in the mirror is 0.4 in magnitude. The negative sign is showing that the image is inverted.